

# **430 SURGERY TEAM**



## **Primary Hyperparathyroidism and Other Common Neck Swellings**

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Green: Doctor's notes & explanation during the lecture.

Blue: Further explanation & team's notes

Red: important notes.

## Parathyroid Glands:

### General characteristics:

We have four parathyroid glands in the posterior aspect of the thyroid gland both of them receive blood supply from the inferior thyroid artery.

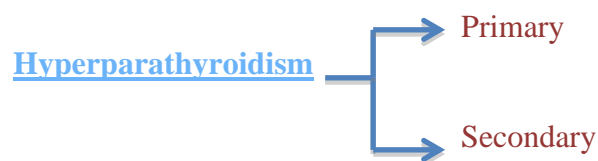
#### ➤ Embryology:

The upper parathyroid glands originate from the 4<sup>th</sup> pharyngeal pouch.  
The lower parathyroid glands originate from the 3<sup>rd</sup> pharyngeal pouch.

#### ➤ Physiology:

- Parathormone hormone (parathyroid hormone, PTH): **Secretion of PTH is inversely related to plasma  $[Ca^{2+}]$  because plasma  $Ca^{2+}$  level is the dominant regulator of PTH secretion:**
  - When plasma  $Ca^{2+}$  level decreases (below 3.5 mg/dL), the secretion of PTH increases (stimulates PTH secretion).
  - When plasma  $Ca^{2+}$  level increases (more than 5.5 mg/dL), the secretion of PTH decreases (inhibits PTH secretion).
- Vitamin D increases  $Ca^{++}$  level in the blood by :
  - $Ca^{++}$  absorption from the intestine.
  - $Ca^{++}$  resorption from the bone (by increasing osteoclastic number & activity).
  - Some believe that it also increases  $Ca^{++}$  reabsorption by the kidney.
- Calcitonin: is released from the c-cells of the thyroid gland decrease  $Ca^{+}$  levels.

The three hormones work together to regulate the plasma concentration of the ionized form of calcium.



**Primary is more common** and is due to overproduction of PTH, causing increased absorption of calcium from intestines, increased vitamin D3 production, and decreased renal calcium excretion, thereby raising the overall serum level of calcium and lowering the amount of phosphorus.

- **Secondary is due to chronic kidney disease or vit D metabolism disorders.**

Serum levels of PTH are increased along with  $Ca^{+}$  (because PTH increases  $Ca^{+}$  levels)

- ❖ The most common cause of hypercalcaemia in the society is primary hyperparathyroidism. (imp)
- ❖ The most common cause of hypercalcaemia in hospitals is malignancy (imp)

➤ Epidemiology:

- ✓ Statistics from Western countries indicate a 0.1-0.5% prevalence rate for PHP.
- ✓ No evidence for geographical variation.
- ✓ 1200- 6000 cases are expected in Aseer area , but when the prof did the research they only got 30 cases !
- ✓ Uncommon in children.
- ✓ 2-3 times in females.

➤ Causes:

Adenomas	Hyperplasia	Carcinoma
84% of cases	15% of cases	1% of cases
Usually <b>NOT</b> palpable	Usually <b>NOT</b> palpable	Presents with palpable swelling
Affects <u>one</u> gland only	Usually affects all <u>four</u> glands	

- ❖ It is unusual to feel the parathyroids because they are in the posterior part of the thyroid.
- ❖ Neck swelling is seen only in cancer (rare) and nodularity in thyroid. So, if we have an increase in calcium and an increase in the PTH in the blood + neck lump it is one of two things:
  - Carcinoma of the parathyroid gland
  - Thyroid lump and the PTH and Ca<sup>+</sup> is not related to it

➤ Clinical manifestations:

Signs and symptoms are related to Increased serum Ca<sup>+</sup>.

The symptoms range from: No symptoms > Mild symptoms > Renal symptoms > Bone symptoms

- Kidneys: Renal stones (late manifestation and usually affects both kidneys)
- Abdomen: peptic ulcer disease & pancreatitis (because high ca has an affect on acids)
- Psychiatric symptoms: Lethargy, confusion, depression, paranoia.
- Fatigue overtones, Nausea, vomiting, muscle pain, constipation,

- Joints: pain
- Bones: Osteoporosis, bone pain and in severe cases pathologic fractures. (High levels of PTH activates bone resorption and bone matrix depletion (PTH removes calcium from bones))

*Almost all patients in KSA present with bone symptoms.*

➤ **Presentation:**

In the west:

- 60 - 70% detected by routine screening.
- **Many are asymptomatic**

In KSA:

- Age 30 – 77 (median 40)
- Females 70 %
- All have advanced bone disease.

**54% have also renal manifestations**

➤ **Cases:**

Case 1:

- 40 y old lady
- # Lt humerus fracture.
- Lt Ureteric stone removed 6 y back
- Rt Ureteric stone removed 3 y back
- Non functioning Lt kidney
- S Ca 11.2mg/dl      P 2.2mg/ dl

Case 2:

- 30 y old lady
- # Rt Radius fracture.
- Long H/O generalized bone ache, heart burn & easy fatigue.
- Lt ureteric stone removed 5 y back
- S Ca 14.3 mg/dl      p 2.4mg/dl

Case 3:

- 45 y old lady
- ESRF
- Advanced bone disease

The pt. was thought to have hyperparathyroidism due to renal failure (tertiary hyperparathyroidism) but after taking proper history, it turned out that she had recurrent renal stones in the past and after investigation the pt. was diagnosed with parathyroid adenoma (primary hyperparathyroidism)

➤ **Investigations:**

- Serum calcium ↑
- PTH ↑
- Phosphorus ↓
- **Primary hyperparathyroidism is only disease that has high Ca low phosphorus.**
- Chloride ↑ (PTH effects on kidney leads to secrete hco3 and retain Cl).

➤ **Imaging:**

- Hand X-Ray:
  - ❖ Resorption of bone.
  - ❖ Cysts.
  - ❖ Lesions like “brown tumor” (fibrosis of the bone due to Osteoporosis)



which is only a radiological description and not an actual tumor).

- U/S (can show adenomas)
- CT (can sometimes show adenomas but not always)
- Nuclear scan " Sestamibi Scan"

#### ➤ Management:

- ❖ All symptomatic patients should be treated
  - Adenoma: remove it
  - Hyperplasia: remove 3 and a half (subtotal parathyroidectomy)

- ❖ Asymptomatic patients:

This is still a controversial topic. However, patients less than 50 yrs. we advise them to do surgery.

#### Conclusion:

- PHP is a very underdiagnosed disease in Saudi Arabia.
- Patients are not diagnosed early
- Complications could be serious and these are avoidable.

#### Recommendation:

- The medical community needs to be more aware of the disease.
- Specifically the diagnosis should be considered in patients with
  - Bilateral or recurrent renal stones
  - Patients with suggestive radiological bone changes

- Naturally in patients with high serum calcium level

### Thyroid Gland:

1) Enlargement (lump, goiter)

OR

2) Disturbed function (increase: hyperthyroidism or decrease: hypothyroidism)

#### 1) Goiter:

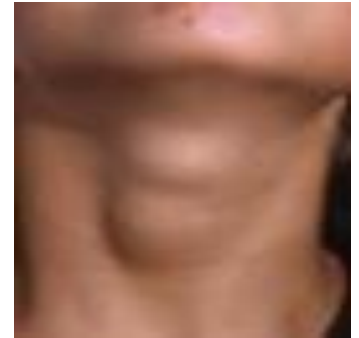
##### Case 1

Fatima is a 30-year old Saudi lady that presented to the Outpatient clinic, complaining of a swelling in the midline of her neck that she had for 2 months.

Q1: What could this be?

Q2: Is it a thyroid swelling?

To differentiate thyroid swelling from others: ask the patient to swallow, if it moved it is a thyroid origin, either thyroglossal cyst or a thyroid swelling, to further differentiate between them ask the patient to protrude her tongue outwards and inspect the throat, if it moved it is a thyroglossal cyst.



A thyroglossal duct cyst is a congenital defect. When the thyroid gland forms during embryonic development, it begins at the base of the tongue and moves down the neck through a canal called the thyroglossal duct. This duct normally disappears once the thyroid reaches its final position in the neck. Sometimes, portions of the duct remain leaving cavities or pockets called cysts, that can fill with fluid or mucus, and may enlarge.



Thyroid



Thyroglossal cyst

Q3: If it is a thyroid swelling, what could be the cause of this swelling?

- Thyroid cyst.
- Multinodular goiter: diffuse, very common, benign, caused by adenomatous hyperplasia of the thyroid gland.

- Inflammatory: common cause: hashimotos thyroiditis: it's a chronic slow-going inflammatory process, an autoimmune disease, no redness or pain or any other signs of inflammation, the acute and sub-acute types are very rare, common cause of hypothyroidism, more common in women.
- Benign tumor.
- Malignancy.

Q4: What points in history, clinical examination, and investigation will help you to differentiate between all these causes of thyroid swelling?

Investigation: US or fine needle aspiration (FNA).

1) US: a very good test to show thyroid lobe and any abnormality such as nodules or cysts

2) FNA (fine needle aspiration): very simple, done in clinics, no need for anaesthesia, directed by US.

3) Thyroid scan: uses a radioactive tracer (isotope of radioactive iodine) and a special camera to measure how much tracer the thyroid gland absorbs from the blood. The tracer can be swallowed or can be injected into a vein. It travels through your body, giving off radiation signals. The camera "sees" the signals and can measure how much tracer the thyroid absorbs from the blood.

The difference between:

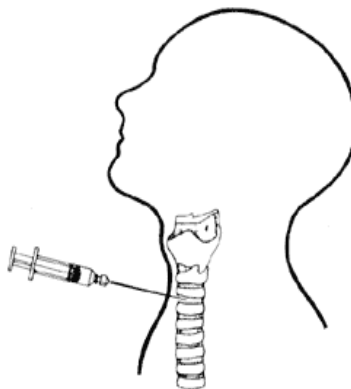
**Hot nodules:** nodules that produce excess thyroid hormone, show up on the scan because they take up more of the isotope than surrounding normal thyroid tissue does, rare malignancy.

**Cold nodules:** are nonfunctioning, don't produce excessive amount of thyroid hormones, don't take up isotope so appear as defects or holes in the scan, more likely to be cancerous.

\*Note that radioactive thyroid scans will show only cold or hot nodules but they won't tell if you have cancer or not.



Nuclear Scans:







## 2) Disturbed thyroid function:

### A-Hyperthyroidism:

#### Case 2:

Ahmed (age 28 years) came to the Outpatient clinic complaining of nervousness, palpitations, sweating, and weight loss. Clinical examination revealed the presence of goitre.



#### ➤ Hyperthyroidism causes:

- Graves disease
- Toxic multinodular goiter
- Toxic nodule: one single toxic nodule starts secreting thyroxine and causes hyperthyroidism.

Graves disease: +/- goiter, benign, an autoimmune disease resulting from a defect in cell-mediated immunity, [antibodies cross react with TSH receptors → overactive thyroid gland → produce too much hormones → results in hyperthyroidism]

Toxic multinodular goiter: is a hyperthyroid state caused by several hyperfunctioning nodules in a multinodular gland, most commonly found in women older than 50 y/o and is usually associated with a history of pre-existing nontoxic multinodular goiter, CVS manifestations are common.

#### ➤ Signs and symptoms:

- Goiter
- Nervousness



- Wt loss + Increased appetite
- Heat intolerance
- Sweating
- Muscular weakness
- Menstrual irregularities
- Tachycardia +/-Arrhythmias
- Warm moist skin
- Bruit & thrill: due to high thyroid vascularity (unique sign)
- Eye signs

➤ Lab:

- Increases T4, T3
- Decreased TSH: very sensitive, first change

➤ Management:

- Medical, if failed:
- Radio-nuclear iodine: goes to the thyroid and kills the cells (100% chance of developing hypothyroidism, not given to young aged women and who wants to get pregnant.
- Surgery: lower chance to develop hypothyroidism)

## B- Hypothyroidism:

### Case 3:

Aisha is a 55-year old lady that presented to your clinic. Her main complaint is related to some recent difficulty in hearing. The family noticed that she started to have difficulty in understanding, that she gained weight, and her voice started to be coarse.



Commonest cause: Hashimotos thyroiditis or post thyroidectomy and supplements weren't taken.

➤ Lab:

- Decreases T4, T3
- Increased TSH

### ❖ Thyroid cancer:

- Papillary
- Follicular
- Medullary
- Undifferentiated
- Lymphoma

1. Papillary cancer:

- The Commonest
- Accounts for 85%
- Appears in early adult life
- Lymphatic spread
- Good prognosis: the best, survival rate is 90-95%

2. Follicular carcinoma:

- Accounts for about 10%
- Differentiation between benign and malignant is not easy
- Blood spread
- Prognosis not as good as papillary

3. Medullary carcinoma:

- Accounts for about 7%
- Arises from C-Cells of the thyroid gland
- Familial medullary carcinoma 25%
- Men syndrome
- Prognosis is not good

4. Undifferentiated: (anaplastic)

- Accounts for about 1%
- Rapidly growing
- Locally invasive
- Rarely curative
- Very aggressive it chokes the patient

5. Lymphoma:

- More common in our part of the world
- Usually diagnosed post op
- Chemo-radiotherapy.

Useful videos recommended by the doctor:

- [http://www.powershow.com/view/f7c3a-NzFhY/NECK\\_SWELLINGS\\_powerpoint\\_ppt\\_presentation](http://www.powershow.com/view/f7c3a-NzFhY/NECK_SWELLINGS_powerpoint_ppt_presentation)
- <http://www.youtube.com/user/ParathyroidTV?v=sD9st1ZPFrQ>
- [http://m.youtube.com/#/watch?v=z-sJ1vrcjZI&desktop\\_uri=%2Fwatch%3Fv%3Dz-sJ1vrcjZI](http://m.youtube.com/#/watch?v=z-sJ1vrcjZI&desktop_uri=%2Fwatch%3Fv%3Dz-sJ1vrcjZI)
- [http://m.youtube.com/watch?v=zf\\_n2mmp3vM&desktop\\_uri=%2Fwatch%3Fv%3Dzf\\_n2mmp3vM](http://m.youtube.com/watch?v=zf_n2mmp3vM&desktop_uri=%2Fwatch%3Fv%3Dzf_n2mmp3vM)

Additional explanation:

1. **PTH**

Synthesized by the parathyroid glands (see Figure 15-3).  
Serum calcium levels regulate secretion of cleaved PTH by negative feedback mechanism.

❖ Bone:

- Stimulates osteoclasts (increased bone resorption).
- Inhibits osteoblasts (stops bone production).

This causes release of calcium and phosphate.

❖ Kidney:

- Increases reabsorption of calcium.
- Increases phosphate excretion.

❖ GI tract:

- Stimulates hydroxylation of 25-OH D to 1,25 OH D.

1,25 OH D (vitamin D) increases the intestinal absorption of dietary calcium (primarily in duodenum) and phosphate.

- Promotes mineralization.

Enhances PTH's effect on bone (synergistic effect).

2. **Calcitonin:**

- Secreted by thyroid C cells.
- Inhibits bone resorption (inhibits calcium release),
- Increases urinary excretion of calcium and phosphate.
- Works as a counterregulatory hormone to PTH.

*best of luck*